

CH2M HILL Hanford Group, Inc.	Manual	ESHQ
STORING, USING, HANDLING, AND	Document	TFC-ESHQ-S-STD-25, REV B-4
TRANSPORTING COMPRESSED AND	Page	1 of 9
LIQUEFIED GASES	Issue Date	November 8, 2006
	Effective Date	November 8, 2006

Ownership matrix

1.0 PURPOSE AND SCOPE

(5.1.1.a, 5.1.1.b, 5.1.1.c, 5.1.1.d, 5.1.1.e, 5.1.1.f, 5.1.2, 5.1.3, [5.1.4](#))

This standard provides requirements for storing, handling, and transporting portable compressed and liquefied gas cylinders related to the Tank Farm Contractor (TFC) scope of work. This standard supports the core functions and guiding principles of [RPP-MP-003](#).

NOTE 1: Bulk gas systems are not addressed in this standard. Installation or modification of bulk compressed gas systems requires a permit from the Hanford Fire Marshal. (See [TFC-ESHQ-FP-STD-10](#) for permit request requirements.)

NOTE 2: Lecture bottles are very small compressed gas cylinders, typically 2-3 inches in diameter and 12-18 inches high. While most gas suppliers offer lecture bottles for purchase, many will not accept the empty or partially full cylinders back for disposal. Lecture bottle disposal can be very costly, depending on the original contents. In order to avoid costly disposal fees and potential hazards, employees should only purchase lecture bottles that can be returned to the distributor. Most distributors do offer a returnable cylinder, although in some cases, these cylinders are slightly larger than typical lecture bottles. Also, keep in mind that distributors' policies toward lecture bottles are subject to change.

Breathing cylinder specifics, including transportation requirements, are presented first; then "other" compressed gas cylinders (including liquefied petroleum gas) specifics; and finally the general requirements for storing and handling pertinent to all compressed gas and liquefied gas cylinders.

2.0 IMPLEMENTATION

This standard is effective on the date shown in the header.

3.0 STANDARD

3.1 Compressed Breathing Air Cylinders

Compressed breathing air cylinders that are part of self-contained breathing apparatus (SCBA) units are purchased by CH2M HILL, and individual manufacturers provide construction and maintenance information on the cylinders. Other compressed air cylinders used as part of supplied air respirator units (including SKA PAK units) also fall under the requirements of this standard. Additional requirements for inspection and use involved with breathing air cylinders are beyond the scope of this standard and are addressed in [TFC-ESHQ-S_IH-C-05](#).

3.1.1 Filling Cylinders

The SCBA and SKA PACK cylinder refilling is performed exclusively by the Hanford Fire Department using specific procedures. Only cylinders designed to be refilled can be refilled.

3.1.2 Storage

- Cylinders shall be secured to prevent falling or rolling
- Properly secured gas cylinders may be stored in a horizontal position
- Stored containers shall not obstruct exit routes
- Containers shall be protected from any object that will produce a harmful cut or other abrasion in the surface of the cylinder
- Storage area temperature shall not exceed 125°F or not be placed in direct sunlight
- Consideration should be given to separate storage of full and empty containers.

3.1.3 Handling

- Personnel should never lift containers by using the container cap, valves, or magnets.

3.1.4 Transportation of Breathing Air Units

NOTE: The SCBA units currently being utilized by the TFC are transported in accordance with Exemption #DOT-E 10915, Rev 14. The requirements listed in Sections 3.1.4.1 through 3.1.4.4 shall be met in their entirety.

The four levels of transportation requirements are based on weight (number of cylinders). The requirements governing the shipments are edited in this standard to only address those required to support Hanford Site activities (e.g., air packaging not included). These requirements apply to both full and empty cylinders.

3.1.4.1 Limited Quantities of Breathing Air Units

- Each package may NOT exceed a gross weight of 66 pounds (3 cylinders)
- Requirements are in accordance with 49 CFR 173.306
- A Commercial Driver's License (CDL) is NOT required
- Cylinder labeling is NOT required
- A placard is NOT required
- Shipping papers are NOT required

- Cylinder valves must be protected by boxing/crating and closing or by an approved method of securely bracing the cylinders in the motor vehicles. The securing method shall not scar, abrade, or dent the cylinder

NOTE: Cylinders shall be transported by commercial carrier or in properly equipped government vehicles in accordance with [DOE/RL-2001-36](#).

3.1.4.2 Material of Trade Category for Breathing Air Units

- Packages may NOT exceed an aggregate gross weight of 440 pounds (20 cylinders)
- Requirements are in accordance with 49 CFR 173.6
- A CDL is NOT required
- Cylinder labeling is NOT required
- A placard is NOT required BUT the shipping box must be marked and labeled
- Shipping papers are NOT required
- Cylinder valves must be protected by boxing/crating and closing or by an approved method of securely bracing the cylinders in the motor vehicles. The securing method shall not scar, abrade, or dent the cylinder

NOTE: Cylinders shall be transported by commercial carrier or in properly equipped government vehicles in accordance with [DOE/RL-2001-36](#).

3.1.4.3 Transporting 21 to 50 Breathing Air Units

- Packages may NOT exceed an aggregate gross weight of 1,000 pounds (50 cylinders)
- Requirements are in accordance with 49 CFR 173-301
- A CDL is NOT required
- A placard is NOT required BUT the shipping box must be marked and labeled
- An On-Site Routine Hazardous Material Shipment Record (ORHMSR) (available from CH2M HILL Transportation & Packaging (372-1826)) IS required
- Cylinder valves must be protected by boxing/crating and closing or by an approved method of securely bracing the cylinders in the motor vehicles. The securing method shall not scar, abrade, or dent the cylinder.

NOTE: Cylinders shall be transported by commercial carrier or in properly equipped government vehicles in accordance with [DOE/RL-2001-36](#).

3.1.4.4 Transporting Greater than 50 Breathing Air Units

- Packages EXCEED an aggregate gross weight of 1,000 pounds (more than 50 cylinders)
- Requirements are in accordance with 49 CFR 173-301
- A CDL IS required
- A placard IS required, AND the shipping box must be marked and labeled
- A Hazardous Material Shipment Record (HMSR) (available from CH2M HILL Transportation & Packaging (372-1826)) IS required
- Cylinder valves must be protected by boxing/crating and closing or by an approved method of securely bracing the cylinders in the motor vehicles. The securing method shall not scar, abrade, or dent the cylinder

NOTE: Cylinders shall be transported by commercial carrier or in properly equipped government vehicles in accordance with [DOE/RL-2001-36](#).

3.2 Other Compressed Gas Cylinders

- **Acetylene cylinders** requirements are in accordance with 29 CFR 1910.102. Handling, storage, and utilization of acetylene in cylinders shall be in accordance with this standard and the Compressed Gas Association Pamphlet, G-1-1066
- **Anhydrous Ammonia** cylinders are not a normal CH2M HILL inventory and any procurement should be carefully evaluated. Anhydrous Ammonia shall be handled, stored, and utilized in accordance with this standard and 29 CFR 1910.111
- **Chlorine cylinders** are not a normal CH2M HILL inventory, and any procurement should be carefully evaluated. Chlorine cylinders must not be stored next to cylinders containing other compressed gases. Additional information on chlorine can be found in publications by the Chlorine Institute
- **Hydrogen cylinders** are not a normal CH2M HILL inventory, and any procurement should be carefully evaluated. Hydrogen cylinders must not be stored next to cylinders containing other compressed gases. Additional information can be found in 29 CFR 1910.103
- **Liquefied Petroleum Gas (including propane)** handling, storage, and utilization shall be in accordance this standard and 29 CFR 1910.110
- **Oxygen cylinders** are used on a regular basis at the 222-S Laboratory. Oxygen cylinders must not be stored next to cylinders containing other flammable compressed gases. Additional information can be found in 29 CFR 1910.104

- **Portable fire extinguishers** frequently involve compressed gas cylinders but are excluded from this standard. See [TFC-ESHQ-FP-STD-07](#) for fire extinguisher requirements.
- **Specialty Gases** are used on a regular basis at the 222-S Laboratory. For requirements regarding specific gases such as acetylene, hydrogen, oxygen, or for toxic or corrosive gases, consult the material safety data sheets (MSDS) for appropriate guidance on the storage and compatibility requirements of the materials in question and/or contact the gas supplier.

3.2.1 Filling Cylinders

Cylinders are filled by off-site vendors. Contracts with these vendors impose the appropriate regulations and requirements for filling. Only cylinders designed to be refilled can be refilled.

3.2.2 Handling Cylinders

1. Personnel who handle containers shall be trained in the safe handling and storage of compressed gases in containers (course #020049, "Compressed Gas Cylinder Safety"). (See [TFC-ESHQ-S IH-C-02](#)). The training does not apply to self-contained breathing apparatus (SCBA) cylinders.
2. Do not use cylinders as rollers, supports, or for any purpose other than to contain and use the original contents.
3. Do not drag, strike, drop, roll cylinders in the horizontal position, or allow them to violently strike each other or another surface.
4. Use a suitable hand truck, forklift truck, or similar handling device with the cylinder properly secured to the device when transporting cylinders.
5. Roll cylinders (milk churning) only for short distances using the curved bottom edge of the cylinder.
6. Do not lift cylinders using the protective cap or with a magnet.
7. Do not use ropes, chains, or slings to suspend cylinders unless the cylinder has appropriate lifting attachments. When appropriate lifting attachments have not been provided, use suitable cradles or platforms to hold the cylinder for lifting.
8. Do not store cylinders at temperatures above 125°F or do not place in direct sunlight.
9. Inspect cylinders prior to use. Check for dents, bulges, cracks, evidence of excess heat, etc. Do not use a cylinder if damaged.
10. Ensure that all connecting devices are free of oil, grease, or other contaminants.
11. When valve protection caps or valve outlet caps and/or plugs are provided by the manufacturer, keep the items on the cylinder at all times except when the cylinder is secured and connected to dispensing equipment.

12. Secure all gas cylinders, whether in service or storage, to prevent falling.

NOTE: When a container or valve is noticeably corroded, notify the gas supplier and comply with instructions/recommendations.

3.2.3 Procuring, Receiving, and Marking Cylinders

This requirement for procuring, receiving, and marking compressed gas cylinders is addressed in [TFC-ESHQ-S IH-C-02](#). Requirements for inventory management are addressed in [TFC-ESHQ-S-STD-20](#).

Fluor Hanford handles all procurement, initial receiving, and inspection to ensure cylinders are properly equipped and marked. Portable cylinders for compressed gas are constructed and maintained in accordance with DOT regulations (U.S. Department of Transportation, 49 CFR, Parts 171-179). Cylinders are equipped with devices identified in OSHA 29 CFR 1910, Subpart H, and CGA publications incorporated into OSHA by reference.

3.2.4 Storing Cylinders

1. Store and post gases according to their hazard class (flammable, asphyxiant, etc.) or name of gas to be stored.
2. Construct storage areas so that they are dry, well ventilated, and made with non-combustible materials. Shelves must be able to support cylinders.
3. Use non-combustible or limited combustible construction (concrete/asphalt is the preferred building material) for the floors of storage areas.
4. Consideration should be given to separating empty cylinders from full ones. It is also suggested that all empty cylinders be marked "empty", unused cylinders "full", and those in service "In Use."

NOTE: All empty cylinders should be treated as if full. For example, cylinders that held oxidizing gases and flammable gases should not be stored together.

5. Close and cap (when applicable) the valves on the empty cylinders and secure the cylinders to prevent falling. Liquefied flammable gas cylinders shall be stored with pressure relief valve in communication with vapor space. Many liquefied flammable gas cylinders, such as those for forklifts, are designed to be stored in the horizontal position in order that the relief valve is in communication with the vapor phase.
6. Avoid prolonged exposure to the ground (earth) or to damp environment. Avoid subsurface storage locations.
7. Protect cylinders from any object that will produce a harmful cut or other abrasion in the surface of the metal. Do not store cylinders near elevators, walkways, unprotected platform edges, or in locations where heavy moving objects may strike or fall on them.
8. Post NO SMOKING signs at all flammable gas storage areas.

9. Store oxidizers and flammable gas containers or combustible materials (especially oil or grease) separately. A distance of twenty feet (six meters) or a non-combustible barrier at least five feet high having a fire resistance rating of at least one half hour is considered a minimum requirement.
10. For requirements regarding specific gases such as acetylene, hydrogen, oxygen, or for toxic or corrosive gases, consult the material safety data sheets (MSDSs) for appropriate guidance on the storage and compatibility requirements of the materials in question and/or contact the gas supplier.
11. When using compressed gas for welding operations, use additional requirements found in 29 CFR 1910.252(b)(4)(vi) and 1910.253.

3.2.5 Transporting Cylinders

After procurement, receiving, and inspection, cylinders are transported by Fluor Hanford to individual facilities where the cylinders are stored, used, and handled in accordance with this standard. Transportation details are addressed in [TFC-PLN-52](#).

1. Secure cylinders and verify that protective valve caps are in place when provided by the manufacturer.
2. Transporting compressed gas cylinders is allowed in a properly equipped government vehicle or commercial carrier ([DOE/RL 2001-36](#)). Shipping compartments should be adequately ventilated.

4.0 DEFINITIONS

No terms or phrases unique to this standard are used.

5.0 SOURCES

5.1 Requirements

1. 29 CFR 1910, Subpart H, "Hazardous Materials." (S/RID)
 - a. Section 101, "Compressed gases general requirements." (S/RID)
 - b. Section 102, "Acetylene." (S/RID)
 - c. Section 103, "Hydrogen." (S/RID)
 - d. Section 104, "Oxygen." (S/RID)
 - e. Section 110, "Storage and Handling of Liquefied Petroleum Gases." (S/RID)
 - f. Section 111, "Storage and Handling of Anhydrous Ammonia." (S/RID)
2. 29 CFR 1910, Subpart I, Section 134, "Respiratory Protection." (S/RID)
3. 29 CFR 1910, Subpart L, Section 157, "Portable Fire Extinguishers."

4. [29 CFR 1926.350, "Gas Welding and Cutting."](#)

ESHQ	Document	TFC-ESHQ-S-STD-25, REV B-4
	Page	8 of 8
STORING, USING, HANDLING, AND TRANSPORTING COMPRESSED AND LIQUEFIED GASES	Effective Date	November 8, 2006

5.2 References

1. 49 CFR 173.6, "Materials of trade exceptions," Part 173, "Shippers-General Requirements for Shipments and Packagings."
2. 49 CFR 173.301, "General Requirements for Shipments and Packagings."
3. 49 CFR 173.306, "Limited Quantities of Compressed Gases."
4. Compressed Gas Association Pamphlet, CGA P-1, "Safe Handling of Compressed Gases in Containers."
5. [DOE/RL-2001-36](#), "Hanford Sitewide Transportation Safety Document."
6. NFPA 55, "Standard for the Storage, Use, and Handling of Compressed Gases and Cryogenic Fluids in Portable and Stationary Containers, Cylinders, and Tanks."
7. RPP-MP-003, "Integrated Environment, Safety, and Health Management System Description for the Tank Farm Contractor."
8. TFC-ESHQ-FP-STD-07, "Portable Fire Extinguishers and Building Fire Barriers."
9. TFC-ESHQ-FP-STD-10, "Hanford Fire Marshal Permits."
10. TFC-ESHQ-S_IH-C-02, "Hazardous Communication."
11. TFC-ESHQ-S_IH-C-05, "Respiratory Protection."
12. TFC-ESHQ-S-STD-20, "Storing and Handling Chemicals."
13. TFC-PLN-52, "Radioactive and Hazardous Materials/Waste Shipments."